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extension/amendment
J. White
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of) Art Unit: 2841
)
GALLUP, K.) Examiner: QUYNH-NHU H. VU
)
Serial No.: 09/738,828)
)
Filing Date: Dec. 15, 2000)
)
For: SILICON STANDOFF FOR)
FIBER OPTIC MODULES)

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AMENDMENT AND RESPONSE TO OFFICE ACTION
DATED NOVEMBER 7, 2001

In response to the Office Action dated November 7, 2001, please enter and consider the following amendments and remarks:

IN THE DRAWINGS

Redlined versions of FIGS. 1A and 1B that show proposed changes in red are submitted herewith. Approval of the changes to the drawings is respectfully requested.

No new matter has been added.

03/21/2002 MADDI1 00000051 501078 09738828

IN THE CLAIMS

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Please cancel claims 1 and 5.

Please add the following new claims:

A1 --8. (New) An electrical connection for coupling a module that has a first surface and a printed circuit board that has a first surface, the electrical connection comprising:

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- a) a ball grid array interposed between the first surface of the module and the first surface of the printed circuit board; and
- b) a standoff for maintaining the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow.

9. (New) The electrical connection of claim 8 wherein standoff includes at least one spherical ball.

10. (New) The electrical connection of claim 9 wherein the spherical ball is removably coupled to the first surface of the module prior to reflow; and wherein the spherical ball is removed from the module after reflow.

11. (New) The electrical connection of claim 9 wherein the spherical ball is fixably coupled to the first surface of the module prior to reflow; and wherein the spherical ball remains coupled to the first surface of the module after reflow.

12. (New) The electrical connection of claim 8 wherein the standoff includes a plurality of spherical balls.

13. (New) The electrical connection of claim 12 wherein the plurality of spherical balls are removably coupled to the first surface of the module prior to reflow; and wherein the plurality of spherical balls are removed from the module after reflow.

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(cont)

14. (New) The electrical connection of claim 12 wherein the plurality of spherical balls is fixably coupled to the first surface of the module; and wherein the plurality of spherical balls remains coupled to the module after reflow.

15. (New) The electrical connection of claim 8 wherein the standoff has a height that is determined based on a predetermined amount of ball collapse.

16. (New) The electrical connection of claim 8 wherein the module is a fiber optic module that has a flexible circuit; and wherein the standoff is coupled to the flexible circuit.

17. (New) The electrical connection of claim 8 wherein the standoff is made from one of a silicon material, an insulative material, and a dielectric material.

18. (New) An electrical connection for coupling a module that has a first surface and a printed circuit board that has a first surface, the electrical connection comprising:

- a) a ball grid array interposed between the first surface of the module and the first surface of the printed circuit board; and
- b) standoff means, disposed between the first surface of the module and the first surface of the printed circuit board, for acting as a shim during reflow.

19. (New) The electrical connection of claim 18 wherein the standoff means is coupled to the first surface of the module and maintains

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cont

the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow; and wherein the standoff means has a height that is determined based on a predetermined amount of ball collapse.

20. (New) The electrical connection of claim 18 wherein the standoff means is removably coupled to the first surface of the module prior to reflow; and wherein the standoff means is removed from the module after reflow.

21. (New) The electrical connection of claim 18 wherein the module is a fiber optic module that has a flexible circuit; and wherein the standoff means is coupled to the flexible circuit.

22. (New) The electrical connection of claim 18 wherein the standoff means is made from one of an a silicon material, an insulative material, and a dielectric material.--

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Please amend the following claims:

2. (Amended) An electrical attachment comprising:
- a module having a bottom surface;
 - a printed circuit board;
 - a ball grid array, interposed between the bottom surface of the module and the printed circuit board;
 - a standoff, positioned on the bottom surface, having a height; wherein the standoff maintains the bottom surface of the module and the printed circuit board at the height of the standoff during reflow.

REMARKS

Claims 1 and 5 have been canceled. New claims 8 - 22 have been added. Claim 2 has been amended. Claims 2 - 4, and 6 - 22 are currently pending in the present application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

ELECTION/RESTRICTION

Paragraphs 1 to 3 of page 2 of the Action set forth the restriction requirement imposed under 35 U.S.C. 121.

The provisional election made by Pam Lau Kee on 10/23/01 to prosecute the invention of Group II, claims 2 to 7 is hereby affirmed.

DRAWING OBJECTIONS

The drawings are objected to under 37 CFR 1.83(a). In response, redlined versions of the drawings with the proposed changes are submitted herewith. Approval of the changes to the drawings is respectfully requested. No new matter has been added.

In response to the objection set forth on page 3, paragraph 6 of the Action that is directed to the "connection pads" and the "flexible circuit interposing the module and the standoff" language, the objected-to language has been cancelled from the claims.

To clarify, the invention, as claimed, does not include or depend on connection pads. However, it is noted that connection pads are well-known to those of ordinary skill in the art. Furthermore, it is noted that the use of a ball grid array to connect one or more bond pads (or connection pads) of a first circuit to one or more corresponding

bond pads (or connection pads) of a second circuit is well-known to those of ordinary skill in the art. In this regard, the connection mechanism of the present invention can be used to couple to connection pads of a first circuit and a second circuit.

In response to the objection set forth on page 3, paragraph 7 of the Action, the hatchings have been removed from FIGS. 1A and 1B.

Accordingly, it is respectfully submitted that the revised figures fully comply with the drawing requirements of 37 CFR 1.83(a). In view of the foregoing, it is respectfully requested that the objections to the drawings be withdrawn.

OBJECTIONS TO THE SPECIFICATION

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter under 37 CFR 1.75(d)(1) and MPEP 608.01(o). As described previously, the “connection pads” and the “flexible circuit interposing the module and the standoff” language has been cancelled from the claims.

Accordingly, it is respectfully submitted that the specification now fully complies with the requirements of 37 CFR 1.75(d)(1) and MPEP 608.01(o). In view of the foregoing, it is respectfully requested that the objections to the specification be withdrawn.

REJECTION OF CLAIMS UNDER 35 U.S.C. 112

On page 4 of the Action, claims 2-7 are rejected under 35 U.S.C. 112, first paragraph as “containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.”

In response to the rejections set forth on page 4, paragraphs 9 to 11 of the Action, the objected to language has been cancelled from the claims.

Accordingly, it is respectfully submitted that the claims fully comply with the patent requirements of 35 U.S.C. 112, first paragraph. In view of the foregoing, it is respectfully requested that the rejection to the claims under 35 U.S.C. 112, first paragraph be withdrawn.

REJECTION OF CLAIMS UNDER 35 U.S.C. 102

Claims 2 to 3 are rejected under 35 U.S.C. 102 for the reasons set forth on page 5 of the Action. Specifically, claims 2 and 3 are rejected under 35 U.S.C. 102 as being anticipated by Ghaem et al. (US Pat. No. 6,046,910), which is hereinafter referred to as the Ghaem reference.

The rejections under 35 U.S.C. 102 are respectfully traversed, at least insofar as applied to the amended claims and new claims, and reconsideration and reexamination of the application is respectfully requested for the reasons set forth herein below.

Paragraph 13 on page 5 of the Action identifies those elements of the Ghaem reference that describe or otherwise anticipate the elements as claimed. Specifically, the Office Action cites element 40 of the Ghaem reference as teaching the standoff of the present invention as claimed.

It is respectfully submitted that element 40 of the Ghaem reference does not fairly teach or suggest the standoff of the present invention as claimed.

The Preform 40 Fails to Teach or Suggest the Standoff as Claimed

Preform 40 fails to teach or suggest the use of a standoff means or standoff as claimed for several reasons. First, the preform 40 performs a very different function than the function of the standoff mechanism of the present invention as described in the specification of the present invention and as claimed. Second, the structure of the perform 40 is very different from the structure of the standoff mechanism of the present invention as described and as claimed.

Different Function

Column 5 line 66 to column 6 line 5 of the Ghaem reference describes the function of the perform 40 as follows:

To minimize or limit intrusion of the polymeric bodies 50 into the component-shadow region 70, one or more polymeric preforms 40 are provided within the gap, between the integrated circuit component 20 and the substrate 46. Each polymeric preform 40 restricts the flow of polymeric precursor into the component-shadow region 70 during formation of the polymeric bodies 50. [emphasis added]

It is noted that the performs 40 perform the function of restricting the flow of polymeric precursor into region 70 during the formation of polymeric bodies 50. In sharp contrast, the standoff of the present invention is “for maintaining the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow,” as claimed. It also appears that the Ghaem reference teaches away from the standoff of the present invention in that the Ghaem reference provides a microelectronic assembly that requires minimal reflow, if any at all (see col. 7, lines 40-46).

Different Structure

Column 6 lines 6 to 20 of the Ghaem reference further describes the structure of the perform 40 as follows:

Each polymeric preform 40 preferably comprises a form, mold or collar located near a corner 42 of the integrated circuit component 20. More particularly, each polymeric preform 40 is optimally an orthogonal member which optimally has its outer sides 41 coincidental with and beneath the perimetric sides 24 of the integrated circuit component 20. Such a strategic placement of the polymeric preform 40 facilitates contact between the polymeric bodies 50 and the perimetric sides 24. Each polymeric preform 40 is preferably composed of a compressible material which does not significantly interfere with the shrinkage of the polymeric bodies 50 during curing, cooling, or cross-linking. The polymeric material used for the polymeric bodies 50 optimally has a compatibly high viscosity to maximize the effectiveness of the polymeric preforms 40. [emphasis added]

FIGS. 1 and 2 of the Ghaem reference show and the description describes the perform 40 as a mold or collar in the shape of an “L” (i.e., an orthogonal member). In this regard, the Ghaem fails to teach or suggest a standoff that includes one or more spherical balls as claimed in claims 9 to 14.

Moreover, it is respectfully submitted that a preform 40 that “is composed of a compressible material” is probably structurally unable to accomplish the task of “maintaining the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow”, as claimed. The Ghaem reference certainly does not suggest that the performs 40 can be used for any purpose except to restrict the flow of polymeric precursor. It is respectfully submitted that a perform made from compressible material that prevents the flow of polymeric precursor is significantly different from a structure needed “to maintain the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow,” as claimed.

In view of the foregoing, it is respectfully submitted that the Ghaem reference fails to teach or suggest the mechanism for attaching a module to a printed circuit board that employs a standoff as claimed.

REJECTION OF CLAIMS UNDER 35 U.S.C. 103

Claim 4 is rejected under 35 U.S.C. 103 for the reasons set forth on the bottom of page 5 and the top of page 6 of the Action. Specifically, claim 4 is rejected under 35 U.S.C. 103 as being unpatentable over Ghaem et al. (US Pat. No. 6,046,910), which is hereinafter referred to as the Ghaem reference.

The rejections under 35 U.S.C. 103 are respectfully traversed, at least insofar as applied to the amended claims and new claims, and reconsideration and reexamination of the application is respectfully requested for the reasons set forth hereinbelow.

The Ghaem Reference Fails to Identify or Address the Problem Addressed by the Present Invention as Claimed

The Ghaem reference fails to identify or even recognize the problem that is identified and addressed by the present invention.

The specification of the present invention on page 1, lines 6 to 8 identifies a specific problem that the present invention solves:

When heavy electrical modules (e.g., fiber optic modules) are attached to a printed circuit board using a ball grid array, the balls may collapse. This results in inadequate electrical connection. (emphasis added)

It is noted that the specification of the present invention identifies a specific problem encountered when using ball grid array technology to attach heavy electrical

modules to printed circuit boards and provides a mechanism to provide a reliable electrical connection between the module and the printed circuit board.

This problem is neither taught nor suggested by the Ghaem reference. First, the Ghaem reference never describes the integrated circuit component 20 as a module or fiber optic module, as claimed. Second, Ghaem fails to mention or suggest the problem of poor electrical connection by the ball grid array due to ball collapse. Third, the Ghaem reference fails to teach or suggest that performs 40 be used as “a standoff for maintaining the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow”, as claimed.

The Ghaem Reference Uses Preforms 40 to Solve a Very Different Problem

In contrast, the Ghaem reference employs the preforms 40 to solve a very different problem. Specifically, it appears the polymeric preforms 40 of the Ghaem reference are placed coincidentally with the corners 42 of the integrated circuit component 20 to limit the boundaries of the polymeric bodies 50 in subsequent steps. In other words, the problem solved by the performs 40 of the Ghaem reference is restricting the flow of the polymeric material in subsequent processing steps.

Column 8 lines 37 to 43 of the Ghaem reference further states that preform 40 may not be needed:

Following the placement of the polymeric preforms 40, polymeric material, or its precursor, is dispensed to form polymeric bodies 50. The polymeric preforms 40 may not be necessary if the polymeric material is precisely dispensed and if the polymeric material has a sufficiently high viscosity to limit the maximum base extent 56 of the polymeric bodies 50 to an acceptable, predetermined value. [emphasis added]

It is clear that the preforms 40 are used by the Ghaem reference to limit the flow of the polymeric material and not to maintain the PCB and a module at a predetermined distance during reflow, as claimed. Because the Ghaem reference is solving a different problem than the present invention as claimed, the Ghaem reference states that performs 40 are not needed if the polymeric material has a viscosity to limit the flow of the polymeric material.

In contrast, the standoff of the present invention, as claimed, is needed to prevent poor electrical connection of the ball grid array that may stem from ball collapse during reflow without regard to the viscosity of polymeric material.

Accordingly, it is respectfully submitted that since the Ghaem reference does not identify the problem identified by the present invention, and in fact, Ghaem is directed to solving an entirely different and unrelated problem, the Ghaem reference cannot be fairly interpreted to teach or suggest the standoff mechanisms of the present invention as claimed.

In view of the foregoing, it is respectfully requested that the rejections under 35 U.S.C. 103 be withdrawn.

New Claims 8-22

New claims 8 to 22 have been added. It is noted that the elements recited by new claims 8 to 22 are fully supported by FIGS. 1A and 1B and the specification (see page 1, lines 20 to 25 of the specification and page 2, lines 2 to 14). No new matter has been added.

New independent claims 8 and 18 set forth an electrical connection without the “flexible circuit” and “connection pads” language that was objected to. Specifically,

claim 8 recites a “standoff for maintaining the first surface of the module and the first surface of the printed circuit board at a predetermined distance during reflow,” which, as described previously, is neither taught nor suggested by the Ghaem reference. Similarly, claim 18 recites a “standoff means, disposed between the first surface of the module and the first surface of the printed circuit board, for acting as a shim during reflow,” which, as also described previously, is neither taught or suggested by the Ghaem reference.

It is noted that the standoff and the standoff means recited in claims 8 and 18 are fully supported by FIGS. 1A and 1B and the specification (see page 1, lines 20 to 25 of the specification).

Moreover, it is noted that dependent claims 9 to 17 are patentable over the Ghaem reference because they depend on independent claim 8 that recite a novel standoff mechanism that is neither taught nor suggested by the Ghaem reference. Furthermore, these dependent claims recite additional elements or limitations that are not taught or suggested by the Ghaem reference.

For example, dependent claim 9 recites that the standoff includes “at least one spherical ball,” which is neither taught nor suggested by the Ghaem reference. Dependent claim 10 recites that the spherical ball is “removably coupled to the module; and wherein the spherical ball is removed after reflow, which is neither taught nor suggested by the Ghaem reference.

Similarly, claims 12 to 14 recite a “plurality of spherical balls,” “plurality of spherical balls are removably coupled to the first surface of the module; and wherein the plurality of spherical balls are removed from the module after reflow,” and spherical

balls fixably coupled to the first surface of the module,” respectively. These specific limitations are not taught or suggested by the Ghaem reference.

Dependent claims 15 and 19 recite, “the standoff has a height that is determined based on a predetermined amount of ball collapse,” which is neither taught nor suggested by the Ghaem reference.

New claims 18 to 22 claim an electrical connection that includes “standoff means” without the “flexible circuit” and “connection pads” language that was objected to.

Dependent claims 16 and 21 specifically recite that the module is a fiber optic module that has a flexible circuit and that the standoff means or standoff is coupled to the flexible circuit. It is noted that the Ghaem reference fails to teach or suggest that element 20 is a fiber optic module and that element 20 has a flexible circuit, as claimed.

In view of the foregoing, it is respectfully submitted that all pending claims of the present invention are now in condition for allowance. Reexamination and reconsideration of the pending claims are requested, and allowance at an early date solicited. The Examiner is invited to telephone the undersigned if he has any suggestions, thoughts or comments, which might expedite the prosecution of this case.

Respectfully submitted,



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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231 on the date below.

Eric Ho
Eric Ho (RN 39,711)

March 7, 2002
(Date)